HOW THE MONTREAL PROTOCOL PROTECTS HEALTH

Introduction

The need to protect human health was the driving force behind the establishment of the Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer (1987). The treaties are the international response to the significant threats to human health and the environment posed by the continued use of ozone depleting substances (ODS) in the global economy.

The Vienna Convention obliges Parties to take appropriate measures to protect human health and the environment against adverse effects resulting or likely to result from human activities which modify or are likely to modify the ozone layer. The Parties co-operate in the conduct of research and scientific assessments on the human health and other biological effects deriving from any modifications of the ozone layer, particularly those resulting from changes in ultra-violet solar radiation having biological effects (UV-B). The Montreal Protocol is widely heralded as a success story both in terms of achieving its direct aims in ODS phase-out targets and the resultant curbs in ozone depletion, and consequent environmental and health benefits.

Health Impacts of Ozone Layer Depletion

Overexposure to UV radiation has a range of serious health effects, including skin cancers (contributing to an increase in melanoma), eye damage (including cataracts) and immune system suppression:

Skin cancer. UV radiation is a cause of skin cancer (melanoma and other types) in fair-skinned humans. Increases in UV radiation due to uncontrolled stratospheric ozone depletion would have led to more severe sunburn and large increases in skin cancer incidence (subject to changes in individual behaviours).

Eye diseases. UV radiation also damages the eye's outer tissues causing "snow blindness", the ocular equivalent of sunburn. UVB's role in cataract formation is complex but some subtypes appear to be associated with UV exposure. As a result, uncontrolled ozone depletion was projected to cause significant increases in cataracts.

Immunosuppression. UV exposure causes both local and whole-body immunosuppression. Increased UV-induced immunosuppression due to uncontrolled ozone depletion could have influenced patterns of infectious disease, and the effectiveness of vaccination, but might also have decreased the occurrence of various autoimmune diseases.

Ecological dimension. Increased UV radiation impairs the growth of plants, including major crops, and damages phytoplankton at sea, which would have affected world food production. Thus, uncontrolled ozone depletion would have contributed to

nutritional and health problems in food insecure nations. Ozone depletion therefore has significant impacts and myriad consequences.

The Montreal Protocol is estimated to have generated major health benefits in terms of avoided mortality and morbidity. There have been a number of estimates about the health impacts avoided by measures to protect the ozone layer and these clearly demonstrate the significance of these global benefits:

Disease reduction. A 2009 study calculated that the excess UV radiation without the intervention of the Montreal Protocol would have had large impacts on the biosphere and on human health, for example Northern Hemisphere mid-latitude ozone losses would have led to a reduction of the sunburn time, at local noon for clear-sky midsummer conditions, from 15 to 5 minutes. The following year a study by USEPA on incidence of cataracts estimated that over 22 million cataract cases would be avoided in the United States up to the year 2100. A 2013 study estimated that with no restrictions on ODS, incidence of skin cancer would have increased by up to two million case a year by 2030. Without effective control of ODSs, even greater increases would have occurred later in the century. Reductions in cancers and cataracts have been valued at more than 11 times the direct investment costs of phasing out the ODS.

Contributions to GDP through avoiding health costs. The phase-out contributed to maintaining Gross Domestic Product growth, including by avoiding human health impacts of ozone depletion (as well as avoiding loss in agricultural and fishery yields). There is no doubt that the Montreal Protocol contributes to a cleaner GDP.

Industrial worker health and safety. The ODS replacement process has had important implications for ensuring the health and safety of workers when operating new equipment and handling alternative chemicals. This is particularly important for the safe use of flammable hydrocarbons as substitute aerosol propellants and the use of chlorinated toxic solvents as replacements for CFCs. Safety at work is therefore addressed in the requirements of Multilateral Fund projects, for example, in the requirements to prepare safety plans by suppliers of foaming and refrigeration equipment, recipient companies and safety authorities, which include a strong element of training for plant technicians and operators. Other health and safety improvements for workers have resulted from the phase-out of carbon tetrachloride use as a solvent, since it is highly toxic.

Agricultural worker health and safety. Methyl bromide used in agriculture and fumigation is highly toxic and has associated acute lung injury and neurological effects. The phase out of this ODS has resulted in health and safety improvements for workers and to neighboring communities, as has the introduction of much safer not-in-kind alternatives such as Integrated Pest Management. Furthermore, the cases of melanoma and non-melanoma cancers avoided are likely to particularly benefit vulnerable populations in areas with high agricultural and outdoor worker populations in regions of high surface UV radiation levels.

Health benefits from refrigeration cold chain. The Montreal Protocol contributes to health benefits through the transfer of refrigeration technology that has allowed for improved food preservation and vaccine storage in developing countries. For example, fish comprises about 20 per cent of the animal protein in the diets of over 3 billion people. Fisheries play a crucial role in providing food security and opportunities to earn income, particularly in developing countries. Improved refrigeration and air conditioning technology can improve and protect cold chain management from ocean/river to plate, and helps sustain the viability of this industry.

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